Rethinking Water Resources Management Under a Climate Change Perspective: From National to Local Level. The Case of Thailand

Chapter 9
Rethinking Water Resources Management Under a Climate Change Perspective: From National to Local Level. The Case of Thailand

Francesca Franzetti, Alessandro Pezzoli and Marco Bagliani

Abstract Likewise many other countries in Southeast Asia region, Thailand has historically enjoyed relatively abundant water resources. Nevertheless, recently, this flood-prone country's attention has shifted to drought, as evidence of a globally changing climate. In order to gain better insights of Thai water resources and disaster management, a review of institutions involved and policies promulgated at national level has been conducted. What comes up from this review is that, on paper, Thailand does present a very complex and sophisticated disaster management devise which, apparently, does not seem to be linked in any way to ordinary water resources management, and what is more important is that a gap emerges when it comes to translate a national-level master plan into lower administrative levels (namely at regional, provincial, district and local administrative organization levels). Poor communication, overlapping roles and responsibilities amongst concerned agencies, lack of budget availability and no long-term vision plans are only few of the shortcomings hindering an effective implementation of disaster prevention and mitigation plans. Hence, this chapter seeks to rethink water-related disaster management in Thailand by (re-)shaping the institutional and policy landscapes, envisaging more holistic coordination mechanisms and information flow which would engage all administrative levels (from national level to local level) and concerned stakeholders.

Keywords Disaster management · Water resources · Thailand

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9.1 Introduction

9.1.1 The Socio-economical Analysis

The interest that lies behind this research can be expressed quoting the World Economic Forum' Global Risk Report 2015 "Global water crises—from drought in the world's most productive farmlands to the hundreds of millions of people without access to safe drinking water—are the biggest threat facing the planet over the next decade" (Ganter 2015).

Water resources are one of the key elements necessary to support global economic and social development. However, nowadays evidence shows that their exploitation at an unsustainable rate, exacerbated by population growth, rapid industrialization and non-effective natural resources management, combined with the increasing threat of the global climate change are making this precious resource even more scarce and finite than ever experienced before by the humankind.

What several regions across the world are currently experiencing suggests the need to take immediate action in rethinking water resources management, introducing a more climate-sensitive approach.

Southeast Asia, in general, and Thailand, in particular, are no exception to these global threats. The region has seen, and will very likely see in the near future, a sharp increase of water-related extreme events and natural hazards such as floods, typhoons, tropical storms but also droughts. These events trigger serious impacts on physical water availability, both quantitatively and qualitatively.

This research analyzes the drought issues in Thailand in order to increase awareness about its management. Thailand is a country with well-established disaster management mechanisms. Nonetheless these mechanisms are a little imbalanced: indeed flood management has received much greater attention (not unjustified though) from the Government whilst drought management still struggles to find its way. This is not to say that drought is more important that flood (or vice versa), only that if one of the ultimate goals of water resources management is to overcome water crises, they both need to be considered by decision makers in an holistic manner. Therefore, this chapter explores what are the existing institutions and policy options to deal with this hazard and suggest a new framework, based on risk-reduction and proactive approach between national and local levels, which might be useful for its management.

The research has been mostly carried out under the SUMERNET's Regional Assessment on water scarcity and drought management in the Mekong Region,[1] led by the Stockholm Environment Institute-Asia Center in Bangkok (SEIA).

The work is structured as follows. Section 9.1 will provide a brief overview of Thailand's physical and socio-economic profile, with a special focus on its water

[1]SUMERNET-Sustainable Mekong Research Network is a long-term program of about 50 different institutions involved, focused on research and capacity building in the Mekong Region covering a wide range of research topics. For more information http://sumernet.org/.

resources status; regional climate change impacts and future projections for the region will be presented, including El Niño-Southern Oscillation (ENSO) influence of the regional climate. Section 9.2 describes briefly the methods and the materials used in this research. Section 9.3 describes an overview of the institutional framework that governs water resources and disaster management at the national level. Section 9.4 introduces laws, policies, strategies and plans of drought's management in Thailand. Section 9.5 analyzes a 4-step risk-based drought management framework, modeled from international guidelines (in particular guidelines for Eastern Europe and the Near East countries), to be tailored to "fit" in the Thai context. Ideal institutional and policy adjustments will be suggested for each of the four steps in particular analyzing in the first step the passage between the national to the local level. Then the challenges and opportunity for Thailand of the framework's application at national and local levels are analyzed in Sect. 9.6. Finally, Sect. 9.7 will look at potentialities and critical challenges of the proposed framework with critical lens, reflecting on the actual feasibility of its application and considering also a possibility for scaling the framework up to (but not only) the regional level.

9.1.2 Thailand and Increasing Threat of Drought

Thailand's climate can be classified as tropical where seasonal monsoon winds, namely the southwest (SW) monsoon and the northeast (NE) monsoon, influence rainfall patterns, in addition to the passage of the Inter Tropical Convergence Zone (ITCZ) and tropical cyclones (TMD 2007).

Meteorologically, Thailand's climate is divided into three main seasons:

- rainy season (or SW monsoon season): usually lasting from mid-May to mid-October. Abundant rain falls all over the country, with August-September being the wettest period of the year (with the exception of southeast region where the rainfall continues until December)
- winter season (or NE monsoon season): usually lasting from mid-October to mid-February. This is the mild period of the year, in the northern regions it can become quite cold
- summer season (or pre-monsoon season): this is considered that usually lasting from mid-February to mid-May. In this period it becomes very warm, with April being the hottest month of the year (especially in the northern part).

Rainfall is a significant, if not the most important source of water for Thailand. Usual rainfall patterns vary considerably across the country as well as Thailand has been historically considered a country with abundant water resources and relies heavily on monsoon rainfall patterns.

Thailand's fluvial system comprises 25 river basins, divided into 254 sub-basins. Of these river basins, 7 have been considered "hot spots" given the economic and

social pressure combined with limited freshwater resources: Chao Phraya and Thajeen (central part), Chi and Moon rivers (northeast), Bang Pakong and easter seaboard (east) and Songkla lake (south) (The World Bank 2011).

Mainly used for domestic consumption, agriculture and industries, this water source is getting rapidly overexploited. As of 2014, according to information provided by the latest DWR's Water Resources Management Strategy of Thailand, water demand can be summarized as following:

- The agricultural sector remain the major water user with more that 80% of the country's total water use, through a mix of large- medium- and small-scale infrastructure system. 65,000 million m^3 are delivered to irrigated areas across the nation. Where there is no irrigation system, agriculture is rain-fed, this area corresponds to 19.2 million ha. In order to support the dry-season cultivation, groundwater extraction is some areas is deeply practiced.
- The 2014 water demand for the household consumption is estimated at 6490 million m^3 with projections for 2027 of an increase of 8260 million m^3.
- Concentration of manufacturing and industrial estates is around Bangkok and in the eastern part of the country. For the water sector is estimated around 4202 million m^3 (projected 7515 million m^3 by 2027).
- The minimum water flow requirement for the dry season should not be less than 27,090 million m^3.

Although the rapid economic growth is not at same rates of 80s and early 90s, rapid urbanization and industrialization are still happening. These processes, while beneficial for poverty reduction and income increase, are putting serious pressure over natural resources, especially water resources.

Significant water quality issues arising from an uncontrolled exploitation of both surface and ground water resources as well as pollution of water bodies from industrial discharges affect both surface and groundwater resources (The World Bank 2011). Some areas experience saline intrusion problems, not only in coastline areas but also in the Northeast, where salinity encroachment combines with soil acidity issues. Salinity intrusion is a concern affecting not only water supply but also crop cultivation fisheries and domestic uses (The World Bank 2011).

It is worth to bear in mind that there is a particular climatic phenomenon that has strong repercussions on the Thailand and South East Asia's climate and weather. This phenomenon is called El Niño Southern Oscillation (ENSO). It is noticed how, during the El Niño period, the South and Southeast Asia suffer rainfall deficits as well representend in Fig. 9.1. In the same time significant increases in intensity (but reduction in the number) of tropical cyclones will lead to more intense storms in the region. Extreme rainfall events will increase the level of flood risk.

Narrowing the focus on the Mekong Region (Cambodia, Lao PDR, Myanmar, Thailand and Vietnam), studies conducted at regional level have shown how a greater inter-seasonal and inter-annual variability in rainfall patterns and hydrology across the region are expected, with large uncertainties on the monsoon pattern's behavior (Adamson and Bird 2010). This fact is witnessed by Thailand which is

Fig. 9.1 Rainfall at end of June 2015: deficit (*brown*) and surplus (*blue*) (WFP 2015)

experiencing in recent years two extremes of water-related disasters, namely the 2011 floods and the ongoing drought started in 2014 that is causing severe water shortages issues across the country.

Although floods and storms are ranked as major hazards (Office of Environmental Policy and Planning 2000), water shortages arising from drought have always been part of Thailand's climatic conditions. Particularly, some parts of the country, such as the Northeastern region and the central plains, can be considered hot spots as concerns drought issues.

Uneven water resources distribution, climate change effects, increased water demand are progressively exacerbating trade-off among different water users and uses are all contributing to the worsening situation. Despite rapid industrialization, Thailand remains an agricultural-based country, relying mostly on rain-fed rice production. Regions which suffer the most are indeed the ones where irrigation canals and water distribution systems are still lacking.

According to the Department of Water Resources (DWR), villages lacking of water supply system are around 7000 (interview with DWR in 2015). Drought and water shortages are threatening directly Thailand's food and energy security. The country's rice production has been hit very hard; its vulnerability could affect global prices on the rice markets. Furthermore, the ongoing severe drought could also result in significant geopolitical consequences since the government is floating the idea to divert new water sources from near river basins (so a transboundary water context) such as the Salween and Yuam at the border with Myanmar or from the Mekong river to pump water to major dams in the Northeastern part (Lovelle 2016).

9.2 Method and Materials

The methodology applied in this research consisted mainly in a qualitative approach. Four main phases can be identified along the information process and most of it was gathered in Thailand, with the support of the Stockholm Environment Institute-Asia Centre.

Firstly, information was collected through an extensive desk-based research characterized by a substantial review of secondary data sources, including water- and disaster-related official policy documents, strategies, action plans, master plans, programs but also reports from NGOs and international development agencies operating in the area (e.g. the World Bank, Asian Development Bank, etc.…), policy briefs from SEI and other research institutes. Relevant sources of information included also the English-based national newspapers such as The Bangkok Post and The Nation and English version of governmental agencies websites. Most of the related scholarly literature was also reviewed.

Secondly, Key Informant Interviews (KIIs) were identified as the most effective tool to collect primary data. Eight KIIs took place in Bangkok from May 2015 to September 2015 and most of the interviewee at the time were high-ranking government officials from the Ministry of Natural Resources and Environment, Department of Water Resources, Department of Groundwater Resources, Department of Disaster Prevention and Mitigation but also researchers and academics from the Hydro and Agro Informatics Institute, Chulalongkorn University and the Mekong River Committee Drought Management Programme. All of these interviews were audio-recorded and transcribed. Seven of these interviews were conducted in English whilst one (with the Department of Disaster Prevention and Mitigation) was conducted in Thai and translated into English.

Some of the information has been also collected with the participation to international conferences and workshops such as the ASEAN Drought workshop and the SUMERNET Regional assessment workshop on water scarcity and drought management in the Mekong region and through personal conversations with colleagues and experts met in Bangkok.

Thirdly, a review of guidelines available, both at the international and regional level, to develop a potential drought management framework was performed. Particularly, three key documents were identified and utilized as a basis for the development of a tailored management framework for Thailand: the 2009 Drought Risk Reduction Framework and Practices: contributing to the implementation of the Hyogo Framework for Action produced by UNISDR; the 2014 Integrated National Drought Management Policy Guidelines: A Template for Action published by the IDMP, a joint program of the Global Water Partnership (GWP) and the UN's World Meteorological Organization (WMO); and the 2015 Guidelines for the Preparation of Drought Management Plans. Development and Implementation in the context of the EU Water Framework Directive elaborated by the GWP for Central and Eastern Europe. The last one was especially useful to see a precedent application of the framework adapted to a more localized context.

Lastly, as a result of this review, a 4-step process was elaborated (see Sects. 9.5.1, 9.5.2, 9.5.3, 9.5.4). For each one of these key steps, drawing on the indications of the conceptual framework, the current situation was highlighted and suggestions for improvement along with organizational arrangements and policy directions were discussed.

Once the framework was developed, a critical reflection on potential possibilities and challenges was presented employing the SWOT-analysis model.

9.3 Water Resources and Disaster Management Institutions and Mechanisms in Thailand

At this stage, a brief overview of the institutional framework that governs water resources and disaster management at the national level is provided. A quite complex institutional net emerges, thus without the pretention to be exhaustive, we will attempt to identify key responsibilities related to water resources management (and consequently drought) for each of the main[2] ministries and agencies involved to provide the reader with a better sense of existing institutional dynamics. As commonly observed in other developing countries, water resources management tasks in Thailand are widespread among several committees, ministries and specialized agencies reflecting every administrative level namely the national, the provincial (76 provinces) and the local (district, sub-district and village) level. In facts, there are about thirty agencies and bureaus involved in water resources governance, reflecting a high fragmentation of roles and responsibilities (ADB 2013).

A first, national committee related to water resources was the National Water Resources Committee (NWRC). Firstly established in 1989 (then revised in 2002 and 2007) and chaired by the Prime Minister, the NWRC was responsible for supervision and monitoring of water resources management and policy formulation. This committee was not based on any legal act that can guarantee a permanent status, therefore NWRC has been often subjected to various changes, without having a real power to implement policies (ADB 2013).

The catastrophic event which triggered a significant reform of high-level water related institutions was the 2011 flood, pushing the Prime Minister, at that time Yingluck Shinawatra, to take action. Hence, with a Prime Minister's Act on "Reconstruction and Future Development" she established two committees for flood prevention and control: a Strategic Committee for Reconstruction and Future Development (SCRFD) and a Strategic Committee for Water Resources Management (SCWRM). The last one was specifically tasked to draft a water and flood management master plan (Funatsu 2014). According to this plan, with another Prime Minister Act on "Water Resources and Flood Control Management Committee", known also as the "Single Command Authority Act" (Funatsu 2014), three other bodies were established:

- A National Water Resources and Flood Policy Committee (NWRFPC) with the mandate to formulate flood management policies and provide recommendations to the Cabinet, chaired by the Prime Minister;

[2]Other ministries consulted and involved in decision-making during a disaster management are the Ministry of Defense (MOD), Ministry of Social Development and Human Security (MOSDHS), Ministry of Industry (MOI), Ministry of Labor (MOL), Ministry of Public Health (MOPH), Ministry of Commerce (MOC), Ministry of Finance (MOF) and the Royal Thai Army (NDPMC 2009).

- A Water Resources and Flood Management Committee (CWRFM) chaired by the Deputy Prime Minister responsible for the execution of adopted policy, measures and approval of water management investment projects action plans, approval of water management investment projects, and monitoring and evaluation the implementation of investment projects. All relevant line agencies are represented in NWFPC and WFMC;
- An Office of National Water Resources and Flood Committee (ONWF) acting as secretariat body for the two committees and serves as single command authority (ADB 2013).

This landscape of committees had been in place until May 2014, when the Royal Thai Army overthrew the Prime Minister, taking control of the Government, and all the long-term flood rehabilitations plans were halted by the National Council of Peace and Order (Funatsu 2014).

A key success towards the introduction of Integrated Water Resources Management process in Thailand has been the establishment of River Basin Committees (RBCs). First steps were taken in mid-nineties when in 1998 the Chao-Phraya River Basin Committee was formed (Anukularmphai, n.d.). In 2002, after the establishment of the Department of Water Resources (Fig. 9.2), twenty-five RBCs were created, each major river basin was further divided into sub-basins to better cope with the necessities and diversity of the hydrological features (Anukularmphai, n.d.). Among the main roles, RBCs have mandate to formulate water resources management plans at basin level and coordinate those plans with relevant agencies, prioritize water allocation in equitable and efficient measures, monitoring and evaluation of other agencies' performance in the basin. Members of RBCs are local authorities, water user groups and community stakeholders (NGOs/academics). Despite their establishment, it cannot be said that River Basin Committees in Thailand do have a proper legal status (Anukularmphai, n.d.).

A special river committee is the Thailand National Mekong Committee (TNMC) in charge of representing the country within the Mekong River Commission (MRC), main intergovernmental agency with mandate of transboundary cooperation of the Mekong River Basin. Other national committees relevant to our analysis, both chaired by the Prime Minister, are the National Committee on Climate Change, established in 2006 as the highest policy-making body on climate issues and the National Disaster Prevention and Mitigation Committee, established in 2007, with the mandate to lay down policy for the formulation of the National Disaster Prevention and Mitigation Plan (NDPMP).

Each of these Ministries along with several departments, bureaus, offices and centers are reflected into lower administrative levels. It goes that, for instance, the DWR has a branch at the provincial level, at district and sub-district level and so has the DDMP etc. It is intuitive to understand the complexity of institutional arrangements as well as the number of government officials involved in the hierarchical Thai bureaucracy.

When a disaster strikes and is officially announced, the mechanism in accordance with the 2007 National Disaster Prevention and Mitigation Plan (NDPMP)

Ministry	Department	Responsibility/ Mandate
	Water Resources (DWR)	Water resources policy, plans and management outside irrigated areas. it hosts the Water Crisis Prevention Centre, in charge proposing and coordinating action plans to solve water crises in disaster areas
Natural Resources and Environment	Groundwater Resources (DGR)	Groundwater resources policy, plans and management
(MNRE)[a]	Office of Natural Resources and Environmental Policy Planning (ONEP)	Natural resources and environmental conservation policy, plans and management. National focal point for climate change
	Pollution Control Dept. (PCD)	Environmental quality standards
	Marine and Coastal Resources (DMCR)	Marine and coastal areas policy, plans and management
	Royal Irrigation (RID)	Water resources management and allocation for irrigation of agricultural areas, dams and storage reservoirs under its commanded areas
Agriculture and Cooperatives (MOAC)	Land Development (LDD)	Land use, management and research. National focal point of United Nations Convention to Combat Desertification
	Agriculture (DOA)	Crop research and development
	Agricultural Extension (DOAE)	Agricultural production and promotion
	Disaster Prevention and Mitigation (DDPM)	Policy-making body and state agency for disaster management.
Interior (MOI)	Metropolitan / Provincial Waterworks Authorities	State-owned companies in charge of water supply provision and distribution respectively in Bangkok and at provincial level
Information and Communication Technology (MICT)	Thai Meteorological (TMD)	Weather and climate forecasting
	National Disaster Warning Centre (NDWC)	Monitor and control over warning towers. Disseminates warnings to line agencies
Science and Technology (MOST)	Geo Informatics Space and Technology Development Agency (GISTDA)	Provides satellite remote sensing and GIS data to public and private sector
	Hydro and Agro Informatics Institute (HAII)	Research, develop and apply science and technologic for agricultural and water resources management
Energy (MOE)	Electricity Generation Authority of Thailand (EGAT)	state-owned utility responsible electric power generation and transmission. In charge of dams/reservoirs operations and maintenance

[a] Initially, the State management over the water resource belonged to MOAC. Between late 1990s and early 2000s the country went through a general institutional reform process that led to the reorganization of some ministries and included the establishment of new departments. Thus, in 2002 a new MNRE was established in order to provide an holistic control, management and exploitation of all natural resources, included water (interview with DWR).

Fig. 9.2 Main institutional actors involved in water resources and disaster management in Thailand

prescribes the activation of Emergency Operation Centers (EOCs) at all administrative levels (national, provincial, district, local plus Bangkok). Administratively, the provincial level plays a crucial role for disaster management. In particular, the provincial governor, who chairs the provincial Disaster Relief Committee is the

person with the right to announce an area stricken by a disaster and has the mandate to approve/reject budget requests for action plans and projects coming from lower levels (e.g. district, sub-district) (interview with DDPM).

The provincial Disaster Relief Committee is responsible for organizing efforts among sectorial agencies (e.g. RID, DWR, LDD, DOAE etc.) coordinates lower levels (districts and sub-districts) while, on paper, the EOCs are in charge of command, control, support and coordination of response and relief measures (NDPMC 2009). However, this do not seem to always match the reality as "EOCs during a drought disaster mainly focus on monitoring" (interview with DDPM). Apart for these institutional arrangements, a very important role, at local scale, during a disaster emergency is played by stakeholders of the civil society such as the Thai Red Cross, non-governmental organizations, charitable organizations and volunteers and the private sector who actively help and cooperate with the local authorities to carry out relief measures for people affected by the disaster (NDPMC 2009).

In times of disaster, important (and often unpopular) decisions need to be taken as the ones concerning water allocation practices.

During normal times, water allocation in Thailand mainly takes place annually at river basin level. For the Chao Phraya river basin, this process usually begins slightly before the end of each rainy season (around October) when an overall assessment of total water volume available in the major multi-purpose reservoirs, Bhumipol and Sirikit dams, is carried out by the central authorities. Once the total amount of water available is known, a pre-seasonal allocation plan to match the irrigation area is carried out (Takeda et al. 2015; Divakar 2011). Consequently the responsible authorities announce farmers on what crops are not recommended for the next dry season (UNESCAP 2000).

Two key actors involved in this process are RID, under MOAC, and EGAT, under MOE which need to come up with a joint decision in order to release the water, since RID regulates water within the irrigation systems whilst EGAT is in charge of dams and reservoirs operations and maintenance (UNESCAP 2000).

Usually the amount of water planned does not correspond to the actual amount of water released (Divakar et al. 2011, personal conversations). Since there is no law defining water rights, what happens is that some users, along the river basin can divert water stealing in this way part of the resources destined to other downstream users (UNESCAP 2000). When a water crisis manifests itself, emergency inter-ministerial meetings are held and normally the highest water allocation priority is always assigned to domestic consumption (interviews with Chulalongkorn University and DWR).

9.4 Drought Management in Thailand: Laws, Policies, Strategies, Plans

Water resources in Thailand are governed by several water-related laws and numerous amendments, regulations and decrees. Nonetheless, at the time of writing, a proper Water Resources Law, which long and tormented approval process

dates back to the early nineties, has never reached the consensus of all political parties, leading unavoidably the country to be characterized by an highly-fragmented legal framework. This is mainly due to an atmosphere of continuous political instability and lack of political will characterizing various governments as well as to the diversity of stakeholder interests in all water-related sectors, amongst other reasons. Hence, given the absence of a comprehensive legally-binding instrument for water resources, this sector is ruled by a number of sectoral laws governing different aspects of this precious resource.

In order to be promulgated by the Royal Thai Government, any policy, plan, program and strategy must be consistent with a broad socio-economic development framework. This overarching development framework assumes the shape of a 5-year National Economic and Social Development Plan, currently at its 11th edition (2012–2016). The plan promotes development strategies to be implemented according to the concept of "sufficiency economy",[3] the guiding principle of Thailand's development since 1974, presented by H.M. King Bhumibol Adulyadej (NESDB 2012).

When dealing with water resources, the milestone documents of Thailand's waterscape are represented by the National Water Vision and Policy both promulgated in 2000. Before being approved, these two documents went through a drafting process based on an extensive participatory approach which involved water-related stakeholders (government official, researchers, NGOs and private sector), in line with the Dublin Principles of Integrated Water Resources Management (Anukularmphai, n.d.). The policy, articulated in 9 pillars, calls for actions to be undertaken such as a suitable and equitable water allocation for all water use sectors, the need to meet water demand for agricultural and domestic uses, the approval and enforcement of the Water Law, insurance of sufficient budget allocation for water-related issues and encouragement of effective stakeholder engagement (Anukularmphai, n.d.).

The only document issued specifically after last year's drought is the Integrated Plan for Drought Management for 2015 which comprises strategies on prevention and mitigation of drought impact by focusing on predictions of drought-prone areas and development of a quick, reliable alert warning system; preparation for disaster by supplying water in drought-prone areas with highest priority to water for consumption; emergency management by establishing operation centers and post-disaster management by providing financial compensation, employment and livelihood for victims (Royal Thai Government 2015).

Climate change is a cross-sectoral issue, well acknowledged in Thailand's policy as demonstrated by the 2000 Initial Communication under the UNFCCC and by the

[3]The Sufficiency Economy is a fundamental concept for the Thai society, especially because it has been developed and promulgated by the king in person. It fosters a sustainable development dominated by a "happy society with a equity, fairness and resilience" vision (NESDB 2012).

Second Communication under the UNFCCC (ONEP 2010). In order to provide guidelines to face challenges posed by climate change the National Strategic Plan on Climate Change 2008–2012 first (Pipitsombat, n.d.; UNDP and Overseas Development Institute 2012) and the National Climate Change Master Plan 2015–2050 then, were also promulgated.

In terms of disaster management Thailand's Climate Change Master Plan 2015–2050 then, were also promulgated. Efforts seem to be based on a sound legal and policy framework, at least in principle. The 2007 Disaster Prevention and Mitigation Act provides the overarching legal mechanisms for disaster management in Thailand (ADPC 2013). According to this Act, a National Disaster Prevention and Mitigation Plan (2010–2014), promulgated in 2009, represents the national policy framework for disaster management within which all the other lower-level plans have to be formulated. The plan envisages all phases of the disaster management cycle, namely prevention and impact reduction, preparedness arrangements, disaster emergency management and post-disaster management (NDPMC 2009). The document also calls for formulation of specific drought-related plans such as Drought Prevention and Mitigation Integrated Action Plan or Dry Season Crops Cultivation Promotion Plan, in line with agricultural water management in the dry season plans. As this plan has expired, a new National Disaster Prevention and Mitigation Plan was approved in 2015 but unfortunately, at the time of writing an English version of this policy document is not available. Beside the national plan, a Strategic National Action Plan (SNAP) on Disaster Risk Reduction 2010–2019 was formulated to fulfill the requirements of the Hyogo Framework for Action (HFA) 2005–2015, adopted right after the tsunami in the Indian Ocean in 2004 (DDMP 2010).

9.5 An Institutional/Organizational Framework to Include Water-Related Disaster in Ordinary Water Resources Management

This section seeks to rethink water-related disaster management in Thailand by proposing a possible re-shaping of institutional and policy landscapes, envisaging more holistic coordination mechanisms and information flow which would engage all administrative levels (from national level to local level) and concerned stakeholders. In the following sections a 4-step risk-based drought management framework, modeled from international guidelines (in particular guidelines for Eastern Europe and the Near East countries) to be tailored to fit in the Thai context, is presented.

9.5.1 Establish a Drought Committee and Related Organizational Arrangements

International guidelines suggest that the first step towards an effective drought management system would be to identify or confirm an appropriate competent authority (GWP CEE 2015). After identifying this authority has been chosen, a formal government resolution or legislation should introduce the legal and institutional framework for the entire drought planning process, establishing roles and responsibilities at all administrative levels (GWP CEE 2015). Once the institutional frameworks along with a suited legislation have been approved, a Drought Committee should be formed. This Drought Committee, regulated by the national authority, should become a permanent body with a strong mandate, which tasks include establishing its organizational structure, setting up specific working groups, defining clear competencies and responsibilities of both the Committee and individual members, providing a communication strategy among all administrative levels, coordinating specific measures among government and stakeholders, assigning tasks during all drought stages (normal, pre-alert, art, emergency) and supervising the overall process evaluation procedures (GWP CEE 2015). Moreover, it is fundamental that the composition of the Drought Committee represents the multi-disciplinary nature of this issue: representatives ranging from national-level decision makers, local authorities, professional institutions providing technical expertise, key stakeholders such as farmers, local communities, NGOs but also energy, tourism, industry sectors and water providers and suppliers should all be able to sit on this national body. Besides, a specific drought task force consisting in Working groups/Committees addressing all the necessary technical assessments and procedures should also be established (GWP CEE 2015).

With the 2007 National Disaster Mitigation and Prevention Act, Thailand has already officially adopted an institutional framework for disaster risk reduction (DRR), which includes drought. According to the 2007 Act, disaster management is under the mandate of the Ministry of Interior, specifically, the Department of Disaster Mitigation and Prevention (DDMP) has the responsibility to coordinate, support and enhance all disaster related activities and formulate national disaster plans. Even though, in principle, Chap. 15 of the 2009 National Disaster Prevention and Mitigation Plan (NDPMP) prescribes a procedure which fully takes into account mitigation and preparedness, putting emphasis on all the disaster cycle management (i.e. pre-disaster, during the disaster and post-disaster), one might observe that, in reality, governance mechanisms concerning drought measures are put in place only when drought strikes. This means that, in practice, full attention is given only to the central phase of disaster management cycle, during the disaster itself. Being drought primarily a water resources management issue, we argue that drought management mandate of the Ministry of Interior should be equally divided —at ministerial level—with the Ministry of Natural Resource and Environment (MNRE), in charge of state management of water resources.

Regarding the set up of a National Drought Committee, there may be no need to establish a further new commission, given the high number of committees and sub-committees that proliferate within the Thai institutional landscape. Rather, it might be suggested a reform of the current[4] National Water Resources and Flood Policy Committee (NWRFPC), and the Committee for Water Resources and Flood Management (CWRFM) established by the Water Resources Master Plan after the 2011 devastating floods. This would lead to the creation of a National Water Resources Flood and Drought Policy Committee (NWRF&DPC), integrating in this way mandates on flood and drought management policy and, accordingly, the CWRFM could be readjusted in a Committee for Water Resources, Flood and Drought Management (CWRF&DM). As concerns the organizational arrangements, in order to make sure that this renewed NWRF&DPC would appropriately include all stakeholder representatives of water-related sectors, reflecting the multi-disciplinary nature of the issues, the current inter-ministerial composition[5] could be extended to representatives of local governments, research organizations and academia, technical service providers (e.g. assessments, modelling, remote sensing etc.), non-governmental organizations and the private sector.

The NWRF&DPC, chaired by the Prime Minister, would have the authority to formulate polices related to flood and drought management, supervising the overall preparedness and mitigation process for both hazards. Under its authority operates the CWRF&DM, in charge of formulating and implementing water management action plans following policy guidelines provided, approving water-related investment projects, endorsing fiscal budget and manpower mobilization and, lastly, preparing the National Drought Management Plan (DMP).

The CWRF&DM could be jointly co-chaired by Ministry of Natural Resources and Environment (MNRE) and Ministry of Science and Technology (MOST).[6] The justification is that MNRE holds the State Management of water resources and, as such, it should promote an overall sustainable integrated water resources management whilst MOST controls two of the most relevant agencies in terms of monitoring and forecasting capacity.

Lastly, the drought task force should be supported by three different working groups or committees that provide services and implement different tasks of the planning process:

[4]After the military junta took the leadership in 2014, the functions of the single-command authority established by the previous government after the 2011 floods have been halted and a new National Water Resources Committee established. For simplicity, here it is preferred to maintain the structure previously utilized, acknowledging that, on reality, the future of these bodies is highly uncertain. It is very complex to deal with non-permanent commissions that keep changing with every government, so in this framework it is assumed that NWRFPC and CWRFM have a permanent nature.

[5]National Water-related Committees usually include representatives from water-resources related ministries such as MNRE (DWR, DGWR), MOAC (RID, DOAE), MOI (DDPM, Public Work), MIST, MOPH etc.

[6]In reality this Committee is chaired only by the Minister of Science and Technology (MOST).

- A Monitoring and Early Warning Committee (M&EWC), responsible for collecting all data related to water resources scattered around different agencies and establishing a Drought and Flood information system and database;
- A Risk Assessment Committee (RAC), responsible of performing risk, impact and vulnerability assessments along with evaluations of past drought events;
- A Mitigation and Relief Committee (MiReC), in charge of coordinating assistance and mitigation measures when critical thresholds are crossed and water shortages become drought. This Committee would act only when activated (during the disaster and post-disaster) and would be chaired by DDPM, under Ministry of Interior.

All these committees mentioned above have primarily an inter-governmental nature. Nonetheless, it would be advantageous to expand their meetings to external consultants from academia, NGOs and other research institutes that perform studies on the same topics, improving their mutual understanding and ensuring a more transparent information sharing.

What has been presented lies at the inter-ministerial and national level. A lower, suitable level to prepare and implement a Local Drought Management Plan would be the river basin level, with the 25 River Basin Committees (RBCs) to be the designated authorities. Following the national-level organization, a drought (and flood) task force (here named River Basin Flood and Drought Management Committee-RBF&DMC) should be created within the RBC as well as the Drought management plan should be adopted as integral part of the River Basin Management Plan, essential requirement as every river basin has different hydro-morphological features, water users and water needs. Accordingly, three similar working committees (RB-M&EWC, RB-RAC and RB-MiReC) should be established. Policy guidelines, methodologies for assessments, drought indicators and thresholds will be performed as requested by the national level, in order to apply an harmonic a holistic approach throughout the country. Furthermore, given that different provinces lie within a river basin boundaries, the RB-MiReC could be chaired by a rotation of provincial governors, maintaining the current disaster management structure (Fig. 9.3).

9.5.2 Ingredients to Develop a National Drought Risk-Based Management Policy

Once the National Drought Committee has been appointed, a second step has to be developed. A risk-based drought policy should be established with a strategy to implement it, then the resulting policy document shall be endorsed by the government (GWP CEE 2015). This policy document may contain a first part regarding the overall framework and principles, pointing out the proactive and risk-based

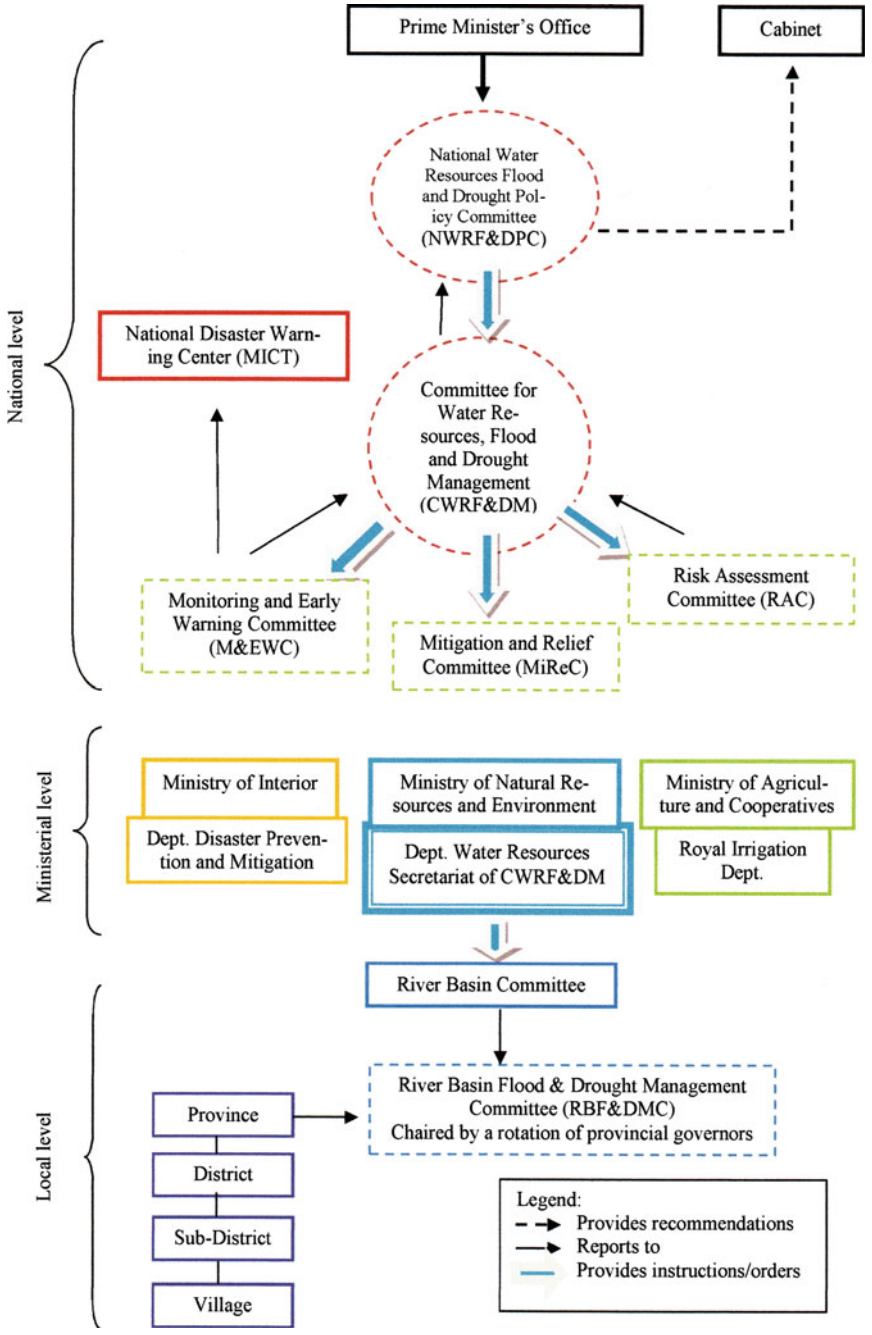

Fig. 9.3 Suggested organizational arrangements (Franzetti 2016)

approach, together with a generic roadmap for its implementation in addition to key phases to develop a Drought Management Plan (DMP) (e.g. administrative, financial, organizational, institutional, etc.) (GWP CEE 2015). Defining objectives along with specific and achievable goals of a drought-risk reduction policy is a decisive step as it represents the basis for the implementation of the DMP (WMO and GWP 2014). A critical passage is that the policy can only be effective if there is a prior identification that grasps the most vulnerable groups, activities and drought-prone areas nationwide (GWP CEE 2015).

As emerged from the policy review conducted, policies that can be related directly or indirectly to drought management have to be researched in sectoral policies and plans; in fact to date the country does not present any single, inter-graded and comprehensive drought management policy and strategy. Nevertheless, in the context of disaster management, Chap. 15 of the 2009 NDPMP contains some relevant policy objectives including "(i) to prevent and mitigate adverse impact of drought on well-being and property of the people; (ii) to facilitate and ensure effective and timely provision of assistance to affected people as well as rehabilitation to normalcy as soon as possible and (iii) to identify the clear and integrative tasks and responsibilities to be taken by all government agencies as well as non-government network organizations for dealing with drought" (NDPMC 2009). Surely, the objectives presented already reflect a disaster-risk based approach and this gives us important indications about the direction which Thailand would like to move towards.

A first recommendation is that it would be necessary to officially consider and recognize drought as a normal and recurrent feature of Thailand's climate, providing in this way political acknowledgement of the water shortage issue permanently, and not just when and where the problem arises. Usually as soon as the drought situation withdraws, drought relief measures are dismissed and water level conditions become acceptable again, all media and political attention on this problem suddenly vanishes until another water shortage happens, leading to another water crisis.

In terms of drought policy formulation, there are plenty of experiences, more or less successful, in drought-prone countries that could be mentioned.

A significant example worth to investigate may be represented by the Australian Drought Policy, which has been constantly revised and improved over time.

A significant point to outline is that this National Drought Policy places great emphasis of farmers responsibilities to manage climate risks (Stone 2014). Thailand could take some inspiration from the way Australia has adopted, among its policy goals, the "self-reliance" concept to encourage farmers when it comes to climate risk management. Besides, given the great importance of the agrarian basis of the country's economy, surely a number of considerations on other sectors, especially agricultural productivity, must be included when drafting the policy.

9.5.3 Drought-Related Data Inventory and Gaps Identification

Regarding data inventory, a third step is necessary. For this reason the GWP CEE guidelines present the information to collect and analyze an effective DMP grouped into six macro categories, namely meteorological, hydrological, agricultural, socio-economic, environmental impact and drinking water supply data. In order to establish a drought information system, it would be necessary to collect and update constantly this information. Nevertheless, it is well known that gathering all these data together is not as easy as it might seem: this type of information is usually scattered around different departments and agencies that not very often share and integrate data, especially when it comes to different ministries (GWP CEE 2015). For the abovementioned reasons, a careful analysis of the constraints (such as weaknesses and obstacles) in terms of data availability should be carried out in the early stage of a drought management process, before developing a DMP. Lastly, it is worth to mention that relying on complete and integrated data also allows to create an appropriate national drought indicators system during the planning phases, which is a crucial condition to ensure the success of the plan.

Some indications on responsibilities to conduct drought risk assessments analyzing risk factors and possible drought areas as well as to verify, update and prepare the drought database and hazard mapping are included in the Thai National Disaster Prevention and Mitigation Plan (Praneat 2014).

Availability and transparent sharing of this type of information determines the conditions for success of a Drought Management Plan. To date, Thailand does not present any comprehensive integrated[7] national drought database: in fact, drought-related data are scattered around various agencies. Every government agency monitors and collects data according to its mandate of competence so, for instance, the Thai Meteorological Dept. is in charge of monitoring weather stations; surface water resources status is be monitored by Dept. of Water Resources; Royal Irrigation Dept. monitors only water status within irrigated areas while EGAT monitors water levels in reservoirs; groundwater resources are monitored by the Dept. of Groundwater Resources; disaster information is monitored by Dept. of Disaster Prevention and Mitigation; Land Development Dept. monitors soil conditions and the Royal Forest Dept. is in charge of forest monitoring and so forth. It is evident, in order to be effective, a strong and harmonic data management capacity is needed and given the low level of communication among all the agencies concerned, current data flowing among agencies cannot be considered sufficient.

The National Disaster Prevention and Mitigation Plan (NDPMP) 2010–2014 prescribed three important actions that fit into this point, namely to review and update existing data on drought-prone areas and create drought hazard maps along with a water resources database; to prepare a database on relevant personnel and

[7]By "integrated" here we are referring to the presence of a single database where all the drought-related information converges.

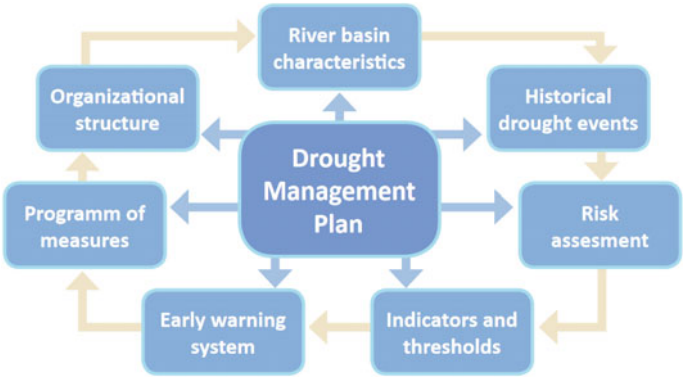

Fig. 9.4 Elements of a drought management plan (GWP CEE 2015)

mechanical equipments in order to ensure their immediate availability and serviceability during a drought event and, lastly, to develop a drought information system. Thus, according to the NDPMP, one of the points required would be the development of a drought database and GIS as well as a drought information sharing system along with the identification of main agencies that should be involved (NDPMC 2009).

9.5.4 Developement and Update a Drought Management Plan

This fourth step might be considered as the heart of a drought planning process. After making sure to possess the right information, the development of a Drought Management Plan (DMP) can begin. According to the GWP CEE Guidelines, an ideal DMP should follow five sub-steps including a definition of the content, a characterization and evaluation of historical drought events, the establishment of appropriate drought indicators and thresholds, the creation of an Early Warning System (EWS) followed by the development of a program of measures (WMO and GWP 2014) (Fig. 9.4). Analyzing Thailand's efforts written in its main policy document for disaster management, the National Disaster Prevention and Mitigation Plan (NDPMP) 2010–2014,[8] one may observe that interestingly most of the key elements highlighted in the conceptual guidelines are already included in this official document along with competent agencies in charge of implementing these tasks.

[8]The NDPMP has been recently updated for the timeframe 2015–2019. However, in this work the previous version will be considered as no official translation of the plan in English is yet available.

Although these tasks seem perfectly in line with a disaster preparedness and mitigation approach, no indications on methodologies or criteria to adopt for assessments or precise classification of droughts are provided in the plan. Therefore, it can be suggested to the National Water Resources Flood and Drought Policy and Management Committee (NWRF&DPC and CWRF&DM) to fill this gap with appropriate methodologies to conduct risk, vulnerability and impacts assessments.

In terms of methodology, a first obstacle is represented by the definition of drought. The terminology adopted by the NDPMP says that "drought refers to the prolonged dry period of weather condition caused by the long period of deficit or no rainfall spanning over large areas. Periods of prolonged drought can trigger widespread and severe effects among people, animals, and vegetation, for instance shortage of water for drinking and household use as well as for agricultural and industrial purposes, substandard or highly limited crop or yield productions, death of livestock etc." (NDPMC 2009).

Now, it can be argued that this definition is quite vague in the sense that no specific thresholds to identify drought stages are provided. This is confirmed by the policy review: most of the documents mention the problem of water shortages and measures that concerned agencies intend to apply, but no thresholds. It follows that it is not clear how different types of drought are identified and treated. In our opinion, this is a significant gap to acknowledge and address: drought affects groups and activities in different ways, requiring ad hoc measures and definitions for every area. Common and shared definitions between government and stakeholders should be discussed and adopted, making possible to begin working collectively on appropriate drought indicators and thresholds.

Looking at drought monitoring system, a recent study of NASA Goddar Space Flight Center highlighted how "the available drought monitoring system in Thailand looks only at the agricultural drought (…) and this was insufficient for analyzing accurate risk management and decision-making" (McCartney et al. 2015). Once again, it is likely that several agencies' technical divisions perform their own analyses but results are not shared among other agencies. It is necessary to come up with unified and acceptable indicators utilized throughout the country, maybe improving also the international cooperation channels through technical staff exchange with countries highly advanced in this field.

Being a country that often experiences extreme climate events, it can be said that Thailand has a good capacity with early warning systems (EWS). This is true for some types of natural hazards including floods, storms, tsunami, tropical cyclones and earthquakes, but it does not apply to drought. The 2004 tsunami that caused tremendous impacts on South and Southeast Asia is considered the trigger point for the adoption and implementation of a disaster EWS, followed by the 2011 Great flood. After the establishment of a National Disaster Warning Center in 2004, in 2012 an agreement was reached in order to develop a Decision Support System for operational flood risk management for the Chao Phraya river basin (central Thailand) (DHI 2012). Recent past drought events have strongly outlined the necessity to establish an effective drought forecasting system and, consequently, an EWS for this hazard. To date, Thailand "does not have a drought forecasting system

but this year (it) will start to implement a project to develop it" (interview with HAII 2015). Hopefully, learning from the dramatic drought experiences, Thailand would invest more resources in the near future.

Regarding the program of measures, it has been already said that the NDMP embeds several measures covering, in principle, all phases of the disaster management cycle. However, preparedness measures found in the plan, are suitable but certainly not enough to cope with drought in a pro-active way. It would be necessary to identify and improve in all water-related policies specific strategies and measures to cope with drought, so every agency would better know in its field what options are effective and which do not work. Every agency could report its best strategies to the CWRF&DM which will incorporate them in a single program of measures, to be reviewed and constantly updated.

Thailand has a fairly good experience in dealing with public hearing and consultations, even though it has not always been effectively implemented. For instance, the country went through a long process of stakeholders consultations to introduce the Integrated Water Resources Management (IWMI) that led to the National Water Policy and Vision not to mention the consultations for drafting the Water Resources Bill (Anukularmphai, n.d.). Consultations could take place at national level, within the NWRF&DPC, where all stakeholders are represented and at the River Basin level, hosted by the River Basin Committees (RBCs), that will report to the Dept. of Water Resources, secretariat of the Flood and Drought Policy and Management Committees. Comments and suggestions will then be analyzed by the NWRF&DPC that will make sure they will be incorporated in the final draft.

As for educational awareness, the NDPMP already prescribes, amongst other activities, to organize "public education training and campaign to raise awareness among all members of community at risk and to provide important information to help them understand potential drought as well as an instruction of drought mitigation strategies" that, for instance, include water restriction measures such as to regulate water use and planting less water—dependent crops in dry season (NDPMC 2009). Thailand is doing a relatively fair job in terms of awareness increase in some fields. For example, the Land Development Department has created programs like the "Volunteer Soil Doctors" with the purpose to train people on a voluntary basis to take care of and deal with soil problems. This idea could be replicated also in specific training programs for drought.

To be fully effective, evaluation procedures should be accompanied by the gap analysis presented in Sect. 9.5.3. Monitoring each of the steps is vital to identify strengths and weaknesses of the whole process. A suggestion here might be to appoint an official responsible for this task within CWRF&DM (the Management Committee) to keep track of the ongoing evaluation whilst it might be useful to produce two separate post-drought evaluations: one conducted within the institutional environment and another one assigned to an external auditor (e.g. a non-profit research institute, or a private consultancy agency). In this way the two evaluations can be crossed, allowing new elements to emerge. During the research period no trace of evaluation procedures on drought-related in English was found.

9.6 Challenges and Opportunities for Thailand

Before reflecting on potential opportunities and challenges of an hypothetical application of the framework, a mention to the assumptions lying behind the framework is necessary. The first one is the approval of the Water Law, providing the country with a proper legal support for water resources management. Secondly, it was assumed that the suggested NWRF&DPC and CWRF&DM have a permanent nature, assuring the continuity of the organizational framework. Thirdly, the Drought Management Plan would be issued as a complementary document of the River Basin Management Plan as the river basin is considered the ideal boundary to deal with water resources management. Lastly, we propose a paradigm shift as drought is not to be considered as a disaster (implying that measures are undertaken when it is already too late) but its recurrent nature is acknowledged and integrated into water resources policies and plans. Hence, keeping these assumptions in mind, in order to perform the following analysis, factors were grouped into five categories representing both challenges and windows of opportunities on institutional, technical, political, economic and financial and socio-cultural aspects (Fig. 9.5).

A first group to be considered is the one of institutional factors that could certainly benefit from a concrete application of the framework. First of all, River Basin Committees would be in the position to confidently implement their mandate and would manage water resources in a more holistic and appropriate manner. Furthermore, a permanent nature of the NWRMF&DPC would involve all stakeholders on a regular basis, providing great room for discussion and consistency, since it is suggested to expand meetings that would allow to academia, NGOs, research institutes and civil society organizations to participate in decision-making

Factor	Opportunity	Challenge
Institutional	• Permanent nature of Committees • Improved communication among agencies • Paradigm shift on drought • Increased stakeholder engagement	• Highly fragmented institutional and legal framework
Technical	• Single and comprehensive database on water resources • Shared drought definition and classification • Gaps identification • Increased assessment capacity	• Lack of qualified personnel
Political	• Ongoing drought represents a (policy) window of opportunity as it was for 2011 floods.	• Unstable political context • Water as object of bargaining
Economic/Financial	• Shift towards pro-active risk management is more cost-effective than the costs of inaction	• Lack of water markets and water-saving incentives
Socio-cultural	• Increased awareness and better preparedness at all levels • Self-reliance concept	• Water as a gift of God • Very hard to change farmers' behavior

Fig. 9.5 Opportunities versus challenges (Franzetti 2016)

processes while formalizing a knowledge exchange full of mutual benefits. This would also lead to improved collaboration and coordination among concerned agencies, creating a constant and more transparent information flow.

To undermine these positive changes there is still a highly-fragmented institutional and legal framework.

A second group examines some technical factors such as, for instance, the concentration of several agencies' efforts under a single Monitoring and Early Warning Committee (M&EWC) in charge of establishing a single and comprehensive database on water-related issues and disasters. More effective early warnings could be provided, not to mention the adoption of common drought definitions, classification and indicators to be implemented throughout the country. Enacting the harmonization of data collection and analysis would be advantageous as it is also linked with technical capacity to perform risk, impacts and vulnerability assessments. Engagement in process evaluation procedures would allow the authorities to support the entire process and identify strengths and weaknesses where an intervention is needed.

And again, the ability to conduct assessments on current and past drought events would shed light on past experiences, serving as a basis for a more tailored program of measures to be implemented.

All these opportunities, however, could be hindered by the lack of highly-qualified and trained personnel, especially at local level. This point has been highlighted by several studies and sectoral capacity assessments (e.g. ADB 2013) as one of the main bottlenecks when it comes to maintaining and implementing measures on the ground.

Implications of political factors become evident if one observes the institutional arrangements that were created after the 2011 floods. It can be hypothesized that the ongoing water crisis in Thailand could potentially act as a trigger to take proactive actions against drought, providing a window of opportunity for the country. A policy statement recognizing that drought is not to be considered only a disaster but needs to be addressed under the ordinary water resources management would reflect an increased awareness among high-level government officials. Moreover, in order to effectively perform a drought preparedness and mitigation process, political stability is an indispensable precondition. Unfortunately, this is definitely a critical, if not daunting, challenge in Thailand: history of several water-related committees established under different governments has shown how the lifetime of these bodies is short. Hence, it would be important that the nature of the suggested committees can become permanent, in order to ensure continuity of the organizational framework.

Naturally, in a very unstable political context, it is hard for government agencies to plan and respond to these changes effectively. This is why expectations from policies, strategies and plans' performance do not always turn out as desired.

Political will is another crucial factor as it influences the outcome of any type of action related (but not only) to water resources. Investments in water infrastructure development to solve water shortages and drought issues, not to mention the constant objective to expand irrigated areas, have always dominated political

discourses but have never definitely solved the problem (Molle 2001). Probably, one of the many complex implications behind this, is that sometimes water, especially in agriculture, can become an object of political bargaining. For example, regarding slow expansion of irrigated areas that does not seem to match the continuous claims from the authorities (RID) to increase irrigation, Achara Deboomne in an opinion on The Nation wrote that "the root of this long-standing problem lies in the fact that policymakers treat irrigation as a political tool, channeling budgets to temporary projects that only address short-term hurdles. No government has ever embarked on a grand-scale project to tackle long-term problems" (Deboonme 2015).

Economic and financial aspects related to this framework's application include some significant constraints that Thailand may face such as the lack of budget availability, even though a shift towards pro-active risk management can be more cost-effective if compared to the costs of inaction. The budgeting system in Thailand is very centralized and it takes a long time before projects can be approved, with the results that very few of them see the light (interview with Chula 2015). For these reason, it is likely that funds for drought related projects would encounter several difficulties along their way. Another recurrent challenge, often mentioned in the literature, is the lack of a real water economics and market-based mechanisms to incentivize water savings, in addition to water restriction measures usually applied in times of crisis. In Thailand, water itself does not have a price as it is considered an "open access" resource (interviews with DWR and Chula 2015). In the agricultural sector, by far the most water-intensive sector, the only fees collected are those for the water service and distribution system, not even enough to cover operation and maintenance costs (Molle 2001).

If the framework were to be fully implemented could also have a significant impact on civil society. Socio-cultural opportunities represented by committing investments in human and financial resources for educational programs, awareness campaigns and drought preparedness meetings at local level could help enormously in preparing people to cope with drought.

Public involvement in the approval process of a Drought Management Plan would give voice to affected local communities and would allow the government to be more sensible to specific local needs, usually ignored at national level, whilst in a long-term perspective it would perhaps increase people's trust in governmental mechanisms. Besides, programs targeting different groups can sensitize people to the importance of water saving practices, where the government does not arrive with market-based interventions. It would mean to cultivate that "self reliance" concept which would provoke a change in farmers' perspectives and behavior, as what usually happens today is that "even if they are advised that there will not be water to grow a second crop because there is no water (…) they will do it anyway because they rely on compensation and assistance schemes from the government" (interview with Chula 2015).

9.7 Conclusion

Nowadays Thailand, and more generally Southeast Asia, is experiencing one of the worst water shortage crises of the past 15 years and drought is representing a serious threat for the country's food and energy security. Main drivers include population growth, rapid urbanization, industrialization and economic integration, unsustainable agricultural practices and depletion of natural resources (especially water) which, combined with increasing water demands, are exacerbating trade-offs amongst all water-related sectors (e.g. household consumption, agriculture, industry, hydropower production, tourism, fisheries, ecological flows maintenance). To complicate the situation, global climate change and the growing threat of extreme natural events are presenting serious challenges for the whole humankind. As a consequence, water resources are increasingly becoming more scarce and finite. Ensuring water availability (quantity and quality) for all sectors of an economy is a key concern of water resources management.

Since, until recently, most of the Thai government's attention has been focusing on flood mitigation and control, this chapter had the objective to suggest a possible management framework as well as to increase general awareness on this insidious, slow-onset hazard.

Results from the reviews have highlighted how fragmented water-related duties and responsibilities are among ministries and line agencies, with overlapping responsibilities, amplified by a low level of communication and information sharing. Furthermore, integrated flood and drought management is acknowledged in most documents, but unfortunately it does not seem to reflect the practice: institutional arrangements exist for flood management but not for drought. It has also been stressed that, even though no single and comprehensive policy to address drought is explicitly presented, some indications can be found scattered around sectorial policies. We have seen that this phenomenon is considered as a disaster and, although in national documents measures to be adopted during all phases of a disaster cycle are prescribed, again this is not reflected on reality as only disaster relief and emergency measures are effectively carried out, confirming the traditional crisis approach in disaster management.

To overcome this, a shift towards a more proactive, risk-based approach would be advisable and in order to succeed, a tailored 4-step drought management framework has been suggested, looking at international guidelines applied elsewhere as a basis. The final outcome of the proposed framework would be the preparation of a Drought Management Plan based on important pillars such as forecasting, monitoring and evaluation system, comprehensive database, risk assessments and early warning system. Organizational arrangements along with a re-shaped scope of existing national committees on water resources have also been discussed presenting a possible reorganization, especially at national level. Opportunities deriving from an actual application of this drought management framework have been identified (e.g. increased awareness, better cooperation among all stakeholders, improved public participation etc.). Nevertheless,

it is predictable that these opportunities could be hindered by structural constraints and barriers such as highly fragmented institutional framework, political unrest and the lack of an appropriate comprehensive water legislation.

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